

CLAIMS

That which is claimed is:

1. A fluid-filled bladder for an article of footwear, the bladder comprising:
a flexible outer barrier that is substantially impermeable to a fluid contained by the bladder; and
a core located within the outer barrier, the core including at least one fusing filament that fuses with the outer barrier and secures the core to the outer barrier.
2. The fluid-filled bladder of claim 1, wherein the core includes a first wall structure that is spaced from a second wall structure, the wall structures being joined by a plurality of connecting members.
3. The fluid-filled bladder of claim 2, wherein the core is manufactured through a double needle bar Raschel knitting process.
4. The fluid-filled bladder of claim 2, wherein the at least one fusing filament is integrated into the wall structures.
5. The fluid-filled bladder of claim 2, wherein the at least one fusing filament is mechanically manipulated into the first and second wall structures.
6. The fluid-filled bladder of claim 1, wherein the at least one fusing filament and the outer barrier are formed of thermoplastic materials fused to one another.
7. The fluid-filled bladder of claim 1, wherein the at least one fusing filament is formed from thermoplastic polyurethane.
8. The fluid-filled bladder of claim 1, wherein the outer barrier is formed of a first barrier layer and a second barrier layer that are fused together around a periphery of the core.

9. A fluid-filled bladder for an article of footwear, the bladder comprising:
 - a flexible outer barrier that is substantially impermeable to a fluid contained by the bladder; and
 - a core located within the outer barrier, the core including a first wall structure that is spaced from a second wall structure, the wall structures being joined by a plurality of connecting members, and the core including at least one fusing filament that is integrated into the wall structures and fuses with the outer barrier to secure the core to the outer barrier.
10. The fluid-filled bladder of claim 9, wherein the at least one fusing filament is mechanically manipulated into the wall structures.
11. The fluid-filled bladder of claim 9, wherein the core is manufactured through a double needle bar Raschel knitting process.
12. The fluid-filled bladder of claim 9, wherein the at least one fusing filament and the outer barrier are formed of a thermoplastic materials.
13. The fluid-filled bladder of claim 9, wherein the at least one fusing filament and the outer barrier are formed to the same type of thermoplastic material.
14. The fluid-filled bladder of claim 9, wherein the at least one fusing filament is formed from thermoplastic polyurethane.
15. The fluid-filled bladder of claim 9, wherein the outer barrier is formed of a first barrier layer and a second barrier layer that are fused together around a periphery of the core.
16. A method for forming a fluid-filled bladder for an article of footwear, the method comprising steps of:
 - positioning a core between a first barrier layer and a second barrier layer;

heating the core and the barrier layers such that a fusing filament integrated into the core fuses with the barrier layers; and
forming a peripheral bond between the barrier layers, the peripheral bond being located substantially around a periphery of the core.

17. The method for forming a fluid-filled bladder of claim 16, further including a step of manufacturing the core to include a first wall structure that is spaced from a second wall structure, the first and second wall structures being joined by a plurality of connecting members.

18. The method for forming a fluid-filled bladder of claim 17, wherein the step of manufacturing the core includes mechanically manipulating the fusing filament into the wall structures.

19. The method for forming a fluid-filled bladder of claim 17, wherein the step of manufacturing the core includes positioning at least a portion of the fusing filament opposite the connecting members.

20. The method for forming a fluid-filled bladder of claim 17, wherein the step of manufacturing the core includes selecting a material of the fusing filament to be identical to a material selected for the barrier layers.

21. The method for forming a fluid-filled bladder of claim 17, wherein the step of manufacturing the core includes selecting a material of the fusing filament to be thermoplastic polyurethane.

22. The method for forming a fluid-filled bladder of claim 16, wherein the step of heating includes utilizing one of the group selected from radio frequency energy, platens of a hot press, ultrasonic welding, UV direct heating, and a radiant heater oven to elevate a temperature of the core and the barrier layers.

23. The method for forming a fluid-filled bladder of claim 16, further including a step of pressurizing the bladder by injecting a fluid into an area between the barrier layers.

24. A method for forming a fluid-filled bladder for an article of footwear, the method comprising steps of:

manufacturing a core that includes a first wall structure spaced from a second wall structure, the first and second wall structures being joined by a plurality of connecting members, and the core including a fusing filament integrated into the wall structures;

positioning the core between a first barrier layer and a second barrier layer;

heating the core and the barrier layers such that the fusing filament in the core fuses with the barrier layers;

forming a peripheral bond between the barrier layers to form a chamber around the core, the peripheral bond being located substantially around a periphery of the core;

injecting a gas into the chamber to place the connecting members in tension, the gas having a pressure above atmospheric pressure; and
sealing the chamber.

25. The method for forming a fluid-filled bladder of claim 24, wherein the step of manufacturing the core includes mechanically manipulating the fusing filament into the wall structures.

26. The method for forming a fluid-filled bladder of claim 25, wherein the step of manufacturing the core includes forming the core through double needle bar Raschel knitting.

27. The method for forming a fluid-filled bladder of claim 24, wherein the step of manufacturing the core includes positioning at least a portion of the fusing filament on the walls opposite the connecting members.

28. The method for forming a fluid-filled bladder of claim 24, wherein the step of manufacturing the core includes selecting a material of the fusing filament to be identical to a material selected for the barrier layers.

29. The method for forming a fluid-filled bladder of claim 24, wherein the step of manufacturing the core includes selecting a material of the fusing filament to be thermoplastic polyurethane.

30. An article of footwear comprising:

an upper for receiving a foot of a wearer; and

a sole structure attached to the upper, the sole structure including a midsole and an outsole that is attached to the midsole, the midsole incorporating a fluid-filled and pressurized bladder that includes:

an outer barrier and a core, the outer barrier being formed of a first barrier layer and a second barrier layer that are fused together around a periphery of the core, the outer barrier being substantially impermeable to a fluid contained by the bladder, and

the core being located within the outer barrier, the core including a first wall structure that is spaced from a second wall structure, the wall structures being joined by a plurality of connecting members, and the core including at least one fusing filament that is integrated into the wall structures and fuses with the outer barrier to secure the core to the outer barrier.

31. The article of footwear of claim 30, wherein the at least one fusing filament is mechanically manipulated into the wall structures.

32. The article of footwear of claim 31, wherein the core is manufactured through a double needle bar Raschel knitting process.

33. The article of footwear of claim 30, wherein the at least one fusing filament and the outer barrier are formed of thermoplastic materials.

34. The article of footwear of claim 33, wherein the at least one fusing filament is formed from thermoplastic polyurethane.

35. The article of footwear of claim 34, wherein the first and second barrier layers are formed from thermoplastic polyurethane.

36. A method for manufacturing an article of footwear, the method comprising steps of:
positioning a core between a first barrier layer and a second barrier layer;
heating the core and the barrier layers such that a fusing filament integrated into the core fuses with the barrier layers;
forming a peripheral bond between the barrier layers, the peripheral bond being located substantially around a periphery of the core;
integrating the core and barrier layers into a sole structure; and
attaching the sole structure to an upper.

37. The method for manufacturing an article of footwear of claim 36, further including a step of manufacturing the core to include a first wall structure that is spaced from a second wall structure, the first and second wall structures being joined by a plurality of connecting members.

38. The method for manufacturing an article of footwear of claim 37, wherein the step of manufacturing the core includes mechanically manipulating the fusing filament into the wall structures.

39. The method for manufacturing an article of footwear of claim 38, wherein the first wall structure, the second wall structure, the connecting member, and the fusing filaments are knit to one another by double needle bar Raschel knitting.

40. The method for manufacturing an article of footwear of claim 39, wherein the step of manufacturing the core includes selecting a material of the fusing filament to be identical to a material selected for the barrier layers.

41. The method for manufacturing an article of footwear of claim 37, wherein the step of manufacturing the core includes selecting a material of the fusing filament to be thermoplastic polyurethane.
42. The method for manufacturing an article of footwear of claim 37, further including a step of pressurizing the bladder by injecting a fluid into an area between the barrier layers.
43. A pressurized bladder for an article of footwear, the bladder comprising:
an outer barrier formed of a first sheet and a second sheet of thermoplastic material, the first sheet and the second sheet being joined at their respective peripheries to form a sealed chamber, the first sheet and the second sheet being substantially impermeable to a pressurized gas contained by the chamber at a pressure of at least 5 pounds per square inch; and
a core located within the chamber, the core including a first fabric layer attached to the first sheet and a second fabric layer attached to the second sheet, the first fabric layer and the second fabric layer being spaced apart and connected together by a plurality of connecting yarns that extend between the first fabric layer and the second fabric layer, and the first fabric layer and the second fabric layer each including fusing filaments formed of a thermoplastic material, the fusing filaments being mechanically manipulated into the first fabric layer and the second fabric layer over a sufficient surface area to form a fused attachment that secures the first fabric layer to the first sheet and secures the second fabric layer to the second sheet when the chamber is pressurized to at least 5 pounds per square inch with a peel strength of at least 5 pounds per linear inch between the fabric layers and the outer barrier.
44. The pressurized bladder of claim 43, wherein the core is manufactured through a double needle bar Raschel knitting process.

45. The pressurized bladder of claim 43, wherein the fusing filaments are formed from thermoplastic polyurethane.

46. A method for forming a fluid-filled bladder for an article of footwear, the method comprising steps of:

manufacturing a core by forming a first fabric layer spaced from a second fabric layer with thermoplastic fusing filaments mechanically manipulated into each of the fabric layers, and the fabric layers being joined by a plurality of connecting yarns; positioning the core between a first sheet of thermoplastic material and a second sheet of thermoplastic material;

heating the core and the sheets of thermoplastic material such that the thermoplastic fusing filaments in the first fabric layer fuse with the first sheet of thermoplastic material, and the thermoplastic fusing filaments in the second fabric layer fuse with the second sheet of thermoplastic material with a peel strength between the fabric layers and the sheets of at least 5 pounds per linear inch;

forming a peripheral bond between the sheets of thermoplastic material, the peripheral bond being located around a periphery of the core; and

injecting a fluid into the bladder to pressurize the bladder to at least 5 pounds per square inch and to place the connecting yarns in tension.

47. The method for forming a fluid-filled bladder of claim 46, wherein the step of manufacturing the core includes selecting a material of the thermoplastic fusing filaments to be identical to a material selected for the sheets of thermoplastic material.

48. The method for forming a fluid-filled bladder of claim 46, wherein the step of manufacturing the core includes selecting a material of the thermoplastic fusing filaments to be thermoplastic polyurethane.

49. The method for forming a fluid-filled bladder of claim 43, wherein the step of heating includes utilizing one of the group selected from radio frequency energy, platens of a hot press,

ultrasonic welding, UV direct heating, and a radiant heater oven to elevate a temperature of the core and the sheets of thermoplastic material.

50. The method for forming a fluid-filled bladder of claim 46, wherein the step of manufacturing the core includes knitting the first fabric layer, the second fabric layer, the thermoplastic fusing filaments, and the connecting yarns by double needle bar Raschel knitting.